

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

PCT



To:

see form PCT/ISA/220

## WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing  
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference  
see form PCT/ISA/220

**FOR FURTHER ACTION**  
See paragraph 2 below

International application No.  
PCT/JP2004/007535

International filing date (day/month/year)  
26.05.2004

Priority date (day/month/year)  
26.05.2003

International Patent Classification (IPC) or both national classification and IPC  
H01L33/00

Applicant  
MATSUSHITA ELECTRIC WORKS, LTD.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

### 2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



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WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
  - ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:
    - ☐ a sequence listing
    - ☐ table(s) related to the sequence listing
  - b. format of material:
    - ☐ in written format
    - ☐ in computer readable form
  - c. time of filing/furnishing:
    - ☐ contained in the international application as filed.
    - ☐ filed together with the international application in computer readable form.
    - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/JP2004/007535

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**Box No. II Priority**

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1. ☒ The following document has not been furnished:

☒ copy of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(a)).

☐ translation of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(b)).

Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.

3. Additional observations, if necessary:

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**Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	3-7, 11-27
	No: Claims	1,2,8-10
Inventive step (IS)	Yes: Claims	15-20, 22-24
	No: Claims	1-14, 21,25-27
Industrial applicability (IA)	Yes: Claims	1-27
	No: Claims	

2. Citations and explanations

see separate sheet

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**Box No. VII Certain defects in the international application**

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The following defects in the form or contents of the international application have been noted:

see separate sheet

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING  
AUTHORITY (SEPARATE SHEET)**

International application No.

PCT/JP2004/007535

**Concerning Section V:**

**I. Claims 1 and 10:**

1. The document US-B-6 498 355, which will be referred to as D1 in the following procedure, describes (cf. column 2, line 49, to column 5, line 39, and Fig. 2) a light-emitting device comprising a submount comprising a mount base (30), at least one light-emitting diode chip (28) mounted thereon, and electrically conducting lines (34, 36) formed on the mount base (30) to be electrically connected to the light-emitting diode chip (28), and a first plate (8, 10, 6) for heat transfer comprising a metallic plate (6), wherein a first plane of the mount base (30) opposed to the metallic plate (6) of the first plate is bonded thermally to said first plate.
2. As a consequence, all the features of claim 1 are anticipated by document D1, and therefore claim 1 is not considered to meet the requirements of Article 33(2) and (3) PCT.
3. The additional feature of dependent claim 10 is also known from document D1. Therefore claim 10 is not considered to meet the requirements of Article 33(2) and (3) PCT either.

**II. Claims 2 to 9:**

1. The light-emitting device according to document D1 describes also that the first plate (8, 10, 6) for heat transfer comprises the metallic plate (6), an insulator layer (10) formed thereon, and an electrical connection pattern layer (8) formed on the insulator layer (10), the first plane of the mount base (30) of said submount is bonded thermally to a portion of the metallic plate (6) of said first plate exposed at a side opposed to said submount by removing the insulator layer and the pattern layer, and the electrically conducting lines (34, 36) of said submount are electrically connected to the electrical connection pattern layer (8) of said first plate by vias (38, 40).

Thus all the features of claim 2 are known from document D1, and therefore claim 2 is not considered to meet the requirements of Article 33(2) and (3) PCT.

2. The document US-A-5 172 301, which will be referred to as D2 in the following procedure, is concerned with the cooling of semiconductor devices in general and would routinely be consulted by a person skilled in the art faced with the problem of cooling a light-emitting semiconductor device. In the cooling arrangement according to document D2 (cf. column 2, line 62, to column 5, line 2, and Figs 2 to 6) a first plate for heat transfer (314) has a protrusion (314b) which has a plane to bond thermally to a mount base (306), wherein the mount base (306) has a recess, so that the protrusion (314b) fits into the recess to bond thermally between them. The additional features of claims 3 and 4 are therefore anticipated by document D2.

As a consequence, claims 3 and 4 are not considered to meet the requirement of Article 33(3) PCT.

3. The additional feature of claim 5 belongs to the routine knowledge of a person skilled in the art of light-emitting device packaging. Claim 5 is therefore not considered to meet the requirement of Article 33(3) PCT.
4. The additional feature of claims 6 and 7 are known from document D2. Claims 6 and 7 are therefore not considered to meet the requirement of Article 33(3) PCT.
5. The additional features of claims 8 and 9 are known from document D1, where a metallic member (24) of solder is described to bond the mount base and the metallic plate. Therefore claims 8 and 9 are not considered to meet the requirements of Article 33(2) and (3) PCT.

### **III. Claims 11 to 20:**

1. The document Patent Abstracts of Japan, vol. 8, No. 49 (E-230); & JP-A-58 201 383, which will be referred to as D3 in the following procedure, describes a semiconductor light-emitting device comprising a groove on a plane opposite to the substrate to which the light-emitting device is bonded. The groove is filled with thermally highly conductive brazing material to increase the heat removal rate.

The person skilled in the art would routinely employ such a groove filled with thermally conductive material also in the mount base according to document D1 instead of the substrate of the light-emitting device itself to further increase the heat

conductivity between the mount base and the first plate. He would thus obtain a device with all the features of claim 11 without employment of inventive thought. Claim 11 is thus not considered to meet the requirement of Article 33(3) PCT.

2. Since the groove described in document D3 is obtained by an etching process, the shape specified in claim 12 is obtained when the parameters of the etching are set accordingly. Claim 12 is thus not considered to meet the requirement of Article 33(3) PCT.
3. The additional feature of claim 13 is known from document D3 as well. Therefore claim 13 is not considered to meet the requirement of Article 33(3) PCT.
4. The additional features of claim 14 belong to the routine knowledge of a person skilled in the art or are evident from document D3. Therefore claim 14 is not considered to meet the requirement of Article 33(3) PCT either.
5. The concentration of the grooves underneath the light-emitting chip location according to claims 15 to 20 is not known nor rendered obvious by the available prior art. Claims 15 to 20 are therefore considered to meet the requirements of Article 33(2) and (3) PCT.

#### **IV. Claims 21 to 27:**

1. The document Patent Abstracts of Japan, vol. 16, No. 236 (E-1210); & JP-A-4 048 740, which will be referred to as D4 in the following procedure, describes a second plate (7) for heat transfer, which a person skilled in the art would understand as a metallic plate, which is bonded thermally to a second plane of a submount comprising a chip (1) and a mount base (2). The person skilled in the art would employ the second plate for heat transfer of document D4 also in a device as described in document D1 and thus routinely obtain a device with all the features of claim 21. Claim 21 is therefore not considered to meet the requirement of Article 33(3) PCT.
2. The additional features of claims 22 to 24 are neither known nor rendered obvious by the available prior art. Claims 22 to 24 therefore appear to meet the requirements of Article 33(2) and (3) PCT.

3. The additional feature of claim 25 falls into the competence of an average practitioner. Claim 25 is thus not considered to meet the requirement of Article 33(3) PCT.
4. The additional features of claims 26 and 27 are known from document D2. Claims 26 and 27 do therefore not appear to meet the requirement of Article 33(2) and (3) PCT.

**Concerning Section VII:**

1. Independent claim 1 is not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (document D1) being placed in the preamble (Rule 6.3(b)(I) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).
2. The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).
3. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 to D4 is not mentioned in the description, nor are these documents identified therein.